

Adjustable Focus Lenses for Respiratory Protection

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The official link for this solicitation is:

<http://www.acq.osd.mil/osbp/sbir/solicitations/sbir20152/index.shtml>

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Description:

Current respiratory protection systems require optical inserts for wearers requiring optical correction. Use of optical correction inserts limit optical compatibility with night vision goggles and weapon systems due to the added eye relief. One reason individual high index lenses are not used is because they cost seven times more than vision correction inserts. Additionally, polycarbonate lenses have distortions for diopters above positive 6 and below negative 6. Logistics associated with optical inserts are costly due to the need for stocking inserts because inserts may require yearly exchange based on annual vision exams. Similarly, stocking custom lenses to accommodate every soldier is not logistically possible or cost effective. Technology is needed that can provide on-the-fly adjustable focus lenses to accommodate all wearers. The vision correction could be adjusted as a wearer's vision changes. Ideally, these lenses could be built into the respiratory protection system and would reduce overall eye relief. There are many technology concepts for adjustable focus eyeglasses. However, none have been demonstrated to work in a respiratory protective mask system and none are able to cover the entire range of optical correction needed by the military (-9 to 9 diopters). The current effort would develop novel adjustable focus lenses to allow wearers to focus on both near and distance objects with one lens. The adjustable focus lenses should be able to be integrated into the existing Avon Protection Systems, Inc. M50 respirator, should be lightweight, and should change focus quickly. All methods of incorporating the lens into the respirator system will be considered (i.e., the lenses could be included in the respirator during or after manufacture). The lenses must be able to withstand a large range of temperature and environmental extremes and

must be resistant to chemical, biological, and non-traditional threat agents. PHASE I: Demonstrate a lab scale prototype/breadboard system that provides adjustable vision correction from -5 to +5 diopters. Demonstrate a response time of PHASE II: Refine optical performance. Demonstrate adjustable vision correction from -9 to +9 diopters. Provide a means for the user to easily change the optical correction. Demonstrate the technology can quickly change and maintain the optical correction until the user decides to change it again. Demonstrate a response time of < 1 sec. Demonstrate performance using human subject volunteers. Field of vision, optical distortion, haze, and clarity should be the same or better than the current M50 mask. Demonstrate the technology can be integrated into the M50 respirator. PHASE III: Complete optical refinement. Optimize fabrication process to demonstrate large-scale production capabilities. Demonstrate ability of technology to be incorporated into a facemask. Demonstrate that the technology is durable and suitable for military combat applications. PHASE III DUAL USE APPLICATIONS: Potential alternative applications include optical correction in industrial, international, and commercial respiratory protection systems.